



## Accredited testing-laboratory

**DAR registration number: DGA-PL-176/94-D1**

**Federal Motor Transport Authority (KBA)  
DAR registration number: KBA-P 00070-97**

**Recognized by the Federal Communications Commission**

**Anechoic chamber registration no.: 90462 (FCC)**

**Anechoic chamber registration no.: 3462C-1 (IC)**

**Certification ID: DE 0001**

**Accreditation ID: DE 0002**

**Accredited Bluetooth® Test Facility (BQTF)**

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**Test report no. : 1-2036-01-02/10 B**  
**Type identification : Synexis TH2**  
**Applicant : beyerdynamic GmbH & Co. KG**  
**FCC ID : OSDSYNEXISTH2**  
**IC Certification No : 3628A-SYNEXISTH2**  
**Test standards : 47 CFR Part 2**  
**47 CFR Part 95**

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## 1 General information

### 1.1 Notes

The test results of this test report relate exclusively to the test item specified in 3.1.1. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

#### Test laboratory manager:

<b>2010-08-05</b>	<b>Marco Bertolino</b>	
Date	Name	Signature

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#### Technical responsibility for area of testing:

<b>2010-08-05</b>	<b>Stefan Bös</b>	<b>i. A.</b>
Date	Name	Signature

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## 1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

e-mail: info@ICT.cetecom.de

Internet: http://www.cetecom-ict.de

State of accreditation:

The test laboratory (area of testing) is accredited according to

DIN EN ISO/IEC 17025

DAR registration number: DGA-PL-176/94-D1

Accredited by:

Federal Motor Transport Authority (KBA)

DAR registration number: KBA-P 00070-97

Testing location, if different from CETECOM ICT Services GmbH:

Name :  
Street :  
Town :  
Country :  
Phone :  
Fax :

## 1.3 Details of applicant

<b>Name:</b>	beyerdynamic GmbH & Co. KG
<b>Street:</b>	Theresienstraße 8
<b>Town:</b>	74072 Heilbronn
<b>Country:</b>	Germany
<b>Telephone:</b>	+49 (0) 7131 61 71-0
<b>Fax:</b>	+49 (0) 7131 617 215
<b>Contact:</b>	Ulrich Roth
<b>E-mail:</b>	roth@beyerdynamic.de
<b>Telephone:</b>	+49 (0) 7131 617 155

## 1.4 Application details

<b>Date of receipt of order:</b>	2010-05-05
<b>Date of receipt of test item:</b>	2010-06-07
<b>Date of start test:</b>	2010-06-07
<b>Date of end test:</b>	2010-06-10
<b>Persons(s) who have been present during the test:</b>	-/-

## 2 Test standard/s

<b>47 CFR Part 2</b>	<b>2009-10</b>	<b>Title 47 of the Code of Federal Regulations; Chapter I- Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations</b>
<b>47 CFR Part 95</b>	<b>2009-10</b>	<b>Title 47 of the Code of Federal Regulations; Chapter I- Federal Communications Commission subchapter D - safety and special radio services; Part 95- Personal radio services</b>

### 3 Technical tests

#### 3.1 Details of manufacturer

Name:	beyerdynamic GmbH & Co. KG
Street:	Theresienstraße 8
Town:	74072 Heilbronn
Country:	Germany

##### 3.1.1 Test item

Kind of test item	:	<b>Auditory communication system Synexis</b>
Type identification	:	<b>Synexis TH2</b>
S/N serial number	:	<b>No information available!</b>
HW hardware status	:	<b>No information available!</b>
SW software status	:	<b>No information available!</b>
Frequency Band	:	<b>216 -217 MHz</b>
Type of Modulation	:	<b>F3E</b>
Number of channels	:	<b>19</b>
Antenna	:	<b>Handheld transmitter Synexis TH2– integrated antenna</b> <b>For more information, please take a look at the sub-clause 8 → Photos of the EUT!</b>
Power Supply	:	<b>3 V DC batteries 2 x 1.5V</b>
Temperature Range	:	<b>-30 °C to +50 °C</b>

#### Handheld transmitter Synexis TH2:

Max. power radiated: 1.86 dBm

FCC ID: OSDSYNEXISTH2

IC: 3628A-SYNEXISTH2

**3.1.2 Additional EUT information For IC Canada (appendix 2)**

IC Registration Number:	<b>3628A-SYNEXISTH2</b>
Model Name:	<b>Synexis TH2</b>
Manufacturer (complete Address):	<b>beyerdynamic GmbH &amp; Co. KG Theresienstraße 8 74072 Heilbronn Germany</b>
Tested to Radio Standards Specification (RSS) No.:	<b>RSS-210 Issue 7</b>
Open Area Test Site Industry Canada Number:	<b>IC 3462C-1</b>
Frequency Range (or fixed frequency) [MHz]:	<b>216 -217 MHz</b>
RF: Power [W] (max):	<b>Handheld transmitter Synexis TH2 Rad. EIRP: 1.53 mW</b>
Antenna Type:	<b>Handheld transmitter Synexis TH2 – integrated antenna</b>  <b>For more information, please take a look at the sub-clause 8 → Photos of the EUT!</b>
Occupied Bandwidth (99% BW) [kHz]:	<b>31.06</b>
Type of Modulation:	<b>F3E</b>
Emission Designator (TRC-43):	<b>31K1F3E</b>
Transmitter Spurious (worst case):	<b>-42.7 dBm @ 12.55 GHz</b>
Receiver Spurious (worst case):	<b>No receiver mode integrated!</b>

**ATTESTATION:**

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned departmental standard(s), and that the radio equipment identified in this application has been subject to all applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

Signature:

Test engineer: Marco Bertolino     Date: 2010-08-05

### 3.1.3 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature	T <sub>nom</sub>	°C	20
Nominal Humidity	H <sub>nom</sub>	%	41
Nominal Power Source	V <sub>nom</sub>	V	3 DC

**Type of power source: 3 V DC batteries 2 x 1.5V**

Deviations from these values are reported in chapter 2



#### 4 Summary of Measurement Results and list of all performed test cases

- No deviations from the technical specifications were ascertained
- There were deviations from the technical specifications ascertained

TC identifier	Description	verdict	date	Remark
RF-Testing	47 CFR Part 2 47 CFR Part 95 G	PASSED	2010-08-05	-/-

Test Specification Clause	Test Case	Pass	Fail	Not applicable	Not performed
§ 2.1046 § 95.639 (e)	Radiated output power	Yes			
§ 2.1055 § 95.629 (d) (2)	Frequency tolerance	Yes			
§ 2.1047	Modulation characteristics	Yes			
§ 2.1047 (e) (3)	Occupied bandwidth	Yes			
§ 95.635 (c) (2) (i)	Spectrum mask	Yes			
§ 2.1053 § 2.1047 § 95.635 (c) (2) (ii)	Radiated spurious emissions	Yes			

## **5 RF measurement testing**

### **5.1 Description of test set-up**

#### **5.1.1 Radiated measurements**

For Part 95 we use the substitution method (TIA/EIA 603).

### **5.2 Referenced Documents**

None

### **5.3 Additional comments**

The channel 216.475 MHz is disabled by the software.

**5.4 Radiated output power**

Standards:
FCC Part 2 – subpart J: Certification § 2.1046
FCC Part 95 – subpart E: Technical regulations § 95.639 (e)

**Handheld transmitter Synexis TH2:**

**Results:**

Channel / Frequency	Detected output power
01 / 216.025 MHz	1.86 dBm
10 / 216.525 MHz	1.78 dBm
19 / 216.975 MHz	1.62 dBm

**Limits:**

FCC Part 95 – subpart E: Technical regulations § 95.639 (e) LPRS 100 mW = 20 dBm
---

### 5.5 Frequency tolerance

Standards:
FCC Part 2 – subpart J: Certification § 2.1055
FCC Part 95 – subpart E: Technical regulations § 95.629 (d) (2)

#### Handheld transmitter Synexis TH2:

#### Results: low channel

Temperature	Frequency MHz	kHz / PPM
-30 °C	216.030001	1.86 / 8.61
-20 °C	216.030162	2.02 / 9.35
-10 °C	216.029937	1.80 / 8.31
0 °C	216.029681	1.54 / 7.12
10 °C	216.028575	0.43 / 2.00
20 °C (V nom)	216.028142	0 / 0 ( Reference)
30 °C	216.027690	-0.45 / -2.09
40 °C	216.027260	-0.88 / -4.08
50 °C	216.026872	-1.27 / -5.88
Voltage		
85 %	216.028255	0.11 / 0.52
115 %	216.028126	-0.02 / -0.07

**Results: middle channel**

Temperature	Frequency (MHz)	kHz / PPM
-30 °C	216.530146	1.91 / 8.81
-20 °C	216.530482	2.24 / 10.36
-10 °C	216.530001	1.76 / 8.14
0 °C	216.529745	1.51 / 6.96
10 °C	216.528655	0.42 / 1.93
20 °C (V nom)	216.528238	0 / 0 ( Reference)
30 °C	216.527765	-0.47 / -2.18
40 °C	216.527190	-1.05 / -4.84
50 °C	216.526743	-.150 / -6.90
Voltage		
85 %	216.528234	0.00 / -0.02
115 %	216.528279	0.04 / 0.19

**Results: high channel**

Temperature	Frequency (MHz)	kHz / PPM
-30 °C	216.980033	2.04 / 9.38
-20 °C	216.980001	2.00 / 9.23
-10 °C	216.980009	2.01 / 9.27
0 °C	216.979777	1.78 / 8.2
10 °C	216.978875	0.88 / 4.04
20 °C (V nom)	216.977998	0 / 0 ( Reference)
30 °C	216.977854	-0.14 / -0.66
40 °C	216.977121	-0.88 / -4.04
50 °C	216.976852	-1.15 / -5.28
Voltage		
85 %	216.977998	0 / 0
115 %	216.977963	-0.04 / -0.16

**Limits:**

FCC Part 95 – subpart E: Technical regulations § 95.629 (d) (2) ± 50 ppm
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**5.6 Modulation characteristics**

Standards:
FCC Part 2 – subpart J: Certification § 2.1047

**Handheld transmitter Synexis TH2:**

**Frequency response of audio circuit:**

An audio signal of 1 kHz was adjusted for a 100 % rated FM deviation with a 95 mV input-level. While maintaining the same amplitude, the input frequency was varied and the detected FM deviation recorded.

Frequency [kHz]	Deviation [kHz]
0.1	3.71
0.2	5.72
0.3	6.24
0.4	6.37
0.5	6.47
0.6	6.55
0.7	6.57
0.8	6.61
0.9	6.60
1.0	6.61
1.2	6.60
1.4	6.62
1.6	6.60
1.8	6.61
2.0	6.60
2.5	6.62
3.0	6.63
3.5	6.63
4.0	6.61
4.5	6.59
5.0	6.54
5.5	6.53
6.0	6.50
6.5	6.47
7.0	6.40
7.5	6.37
8.0	6.30
8.5	6.25
9.0	6.18
9.5	6.11
10.0	6.05

**Modulation limiting:**

While maintaining the same frequency, the input amplitude was varied and the detected FM deviation recorded.

Audio signal level	Deviation [kHz]
1 mV	1.34
2 mV	1.59
3 mV	1.78
4 mV	1.95
5 mV	2.09
10 mV	2.65
20 mV	3.45
50 mV	5.06
100 mV	6.63
200 mV	6.64
300 mV	6.74

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## 5.7 Occupied bandwidth

Standards:
FCC Part 2 – subpart J: Certification § 2.1047 (e) (3)

### Handheld transmitter Synexis TH2:

Channel / Frequency	99 % bandwidth
1 / 216.025 MHz	31.06 kHz
10 / 216.525 MHz	31.06 kHz
19 / 216.975 MHz	31.06 kHz

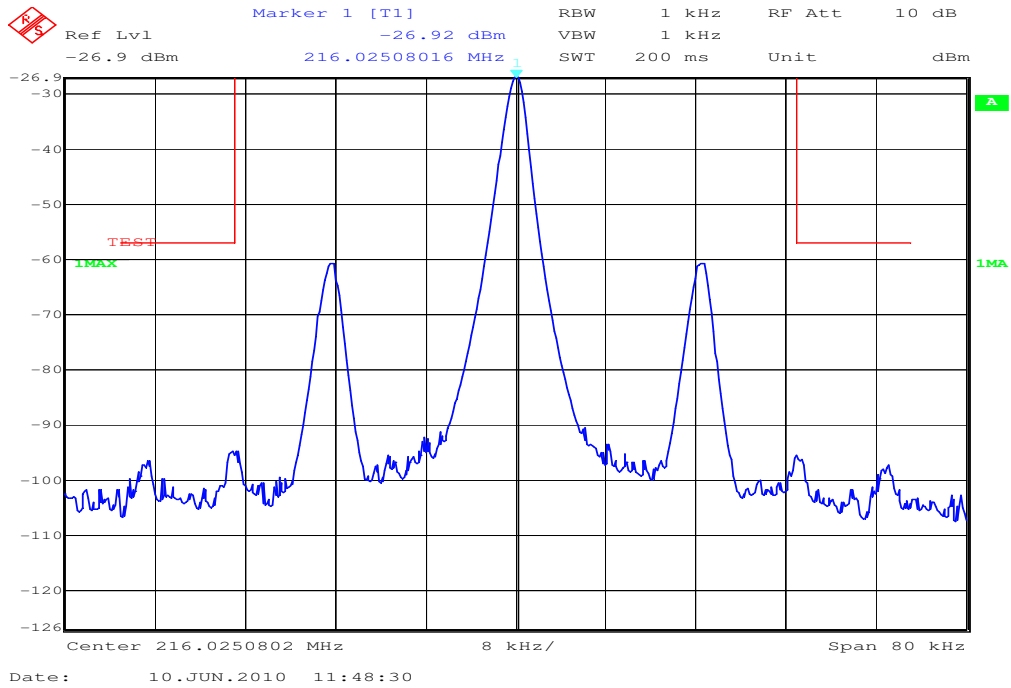


5.8 Spectrum mask

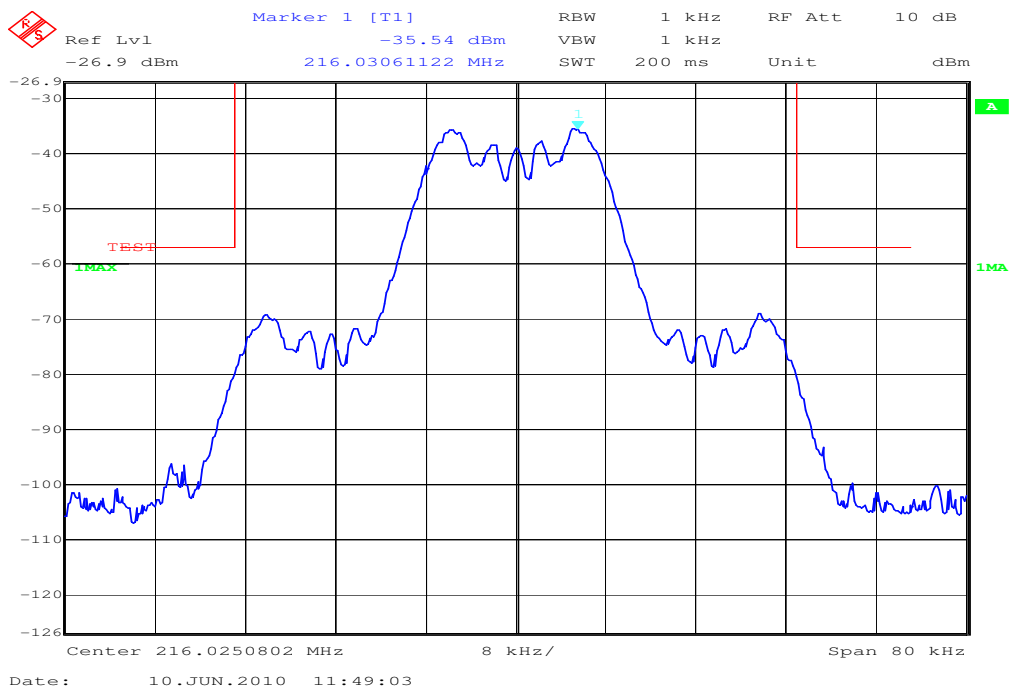
Standards:
FCC Part 95 – subpart E: Technical regulations § 95.635 (c) (2) (i)

**Handheld transmitter Synexis TH2:**

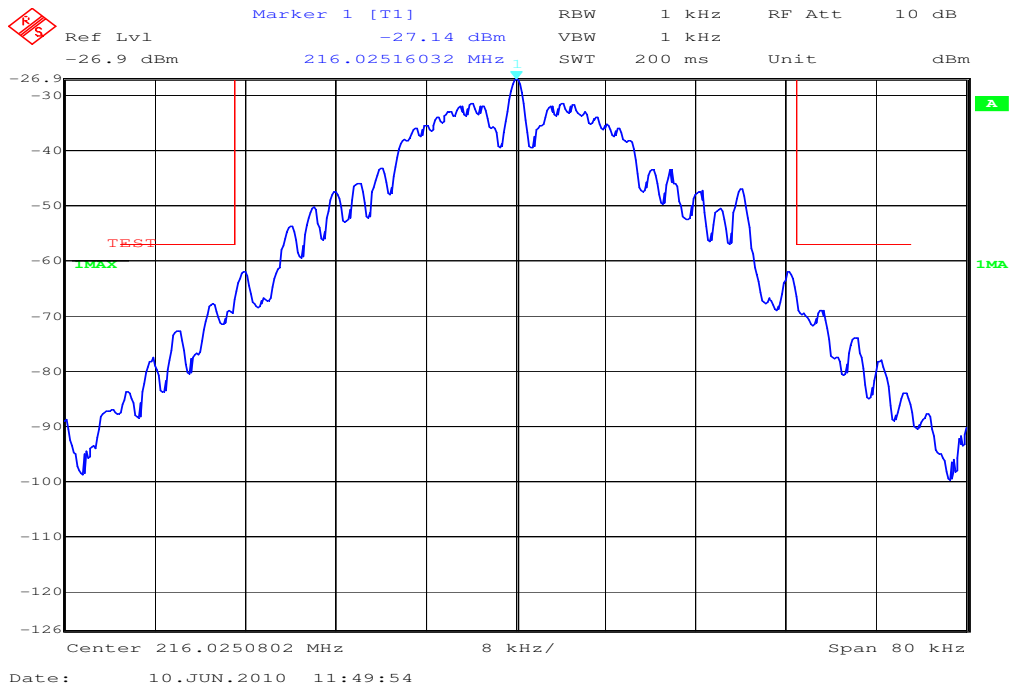
**Plot 1: lowest channel – unmodulated carrier**



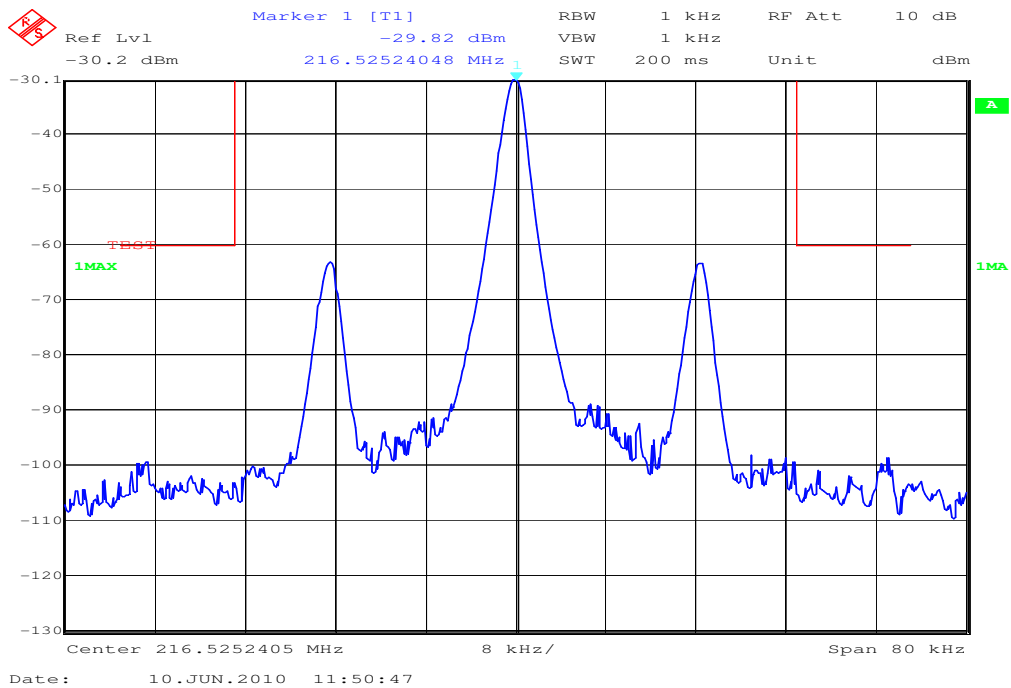
**Plot 2: lowest channel – 1kHz modulated carrier**



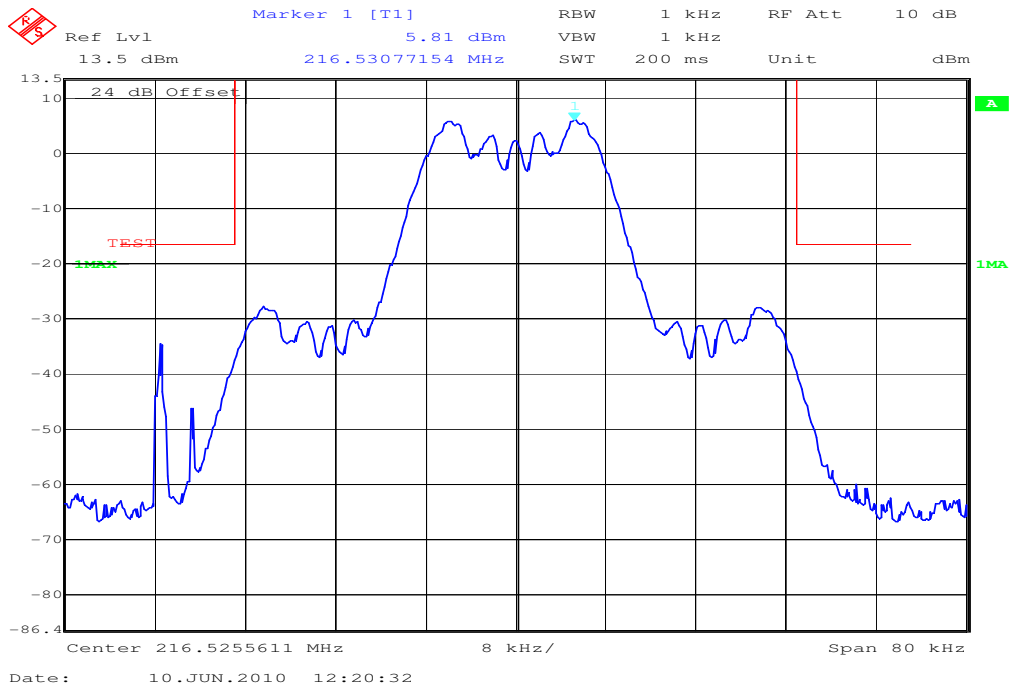
Plot 3: lowest channel – Range 0.1 kHz → 10 kHz modulated carrier



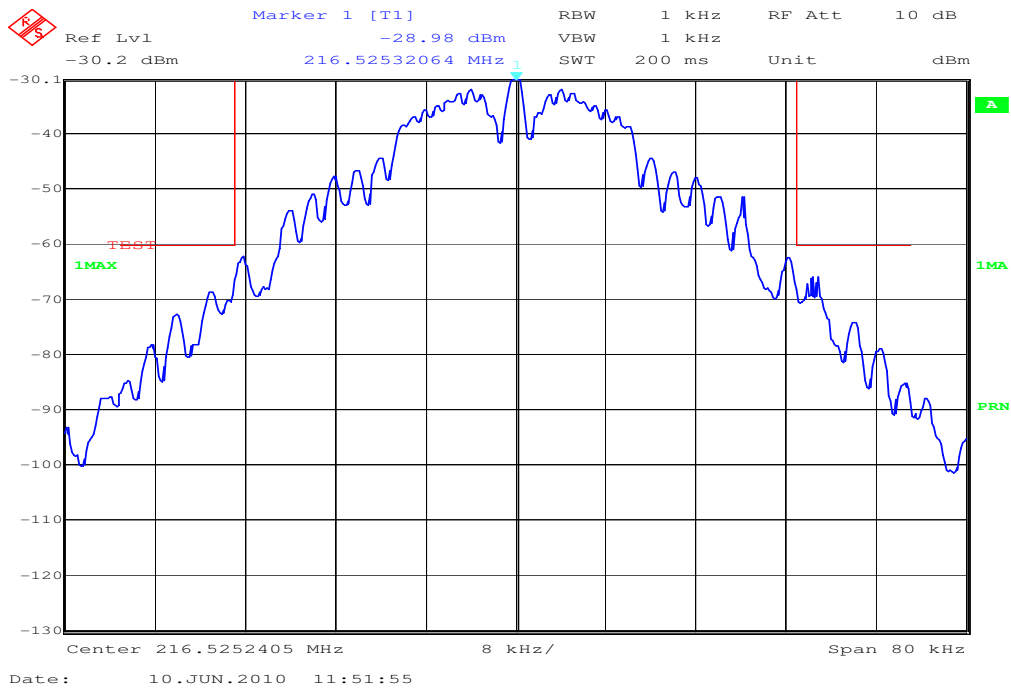
Plot 4: middle channel – unmodulated carrier



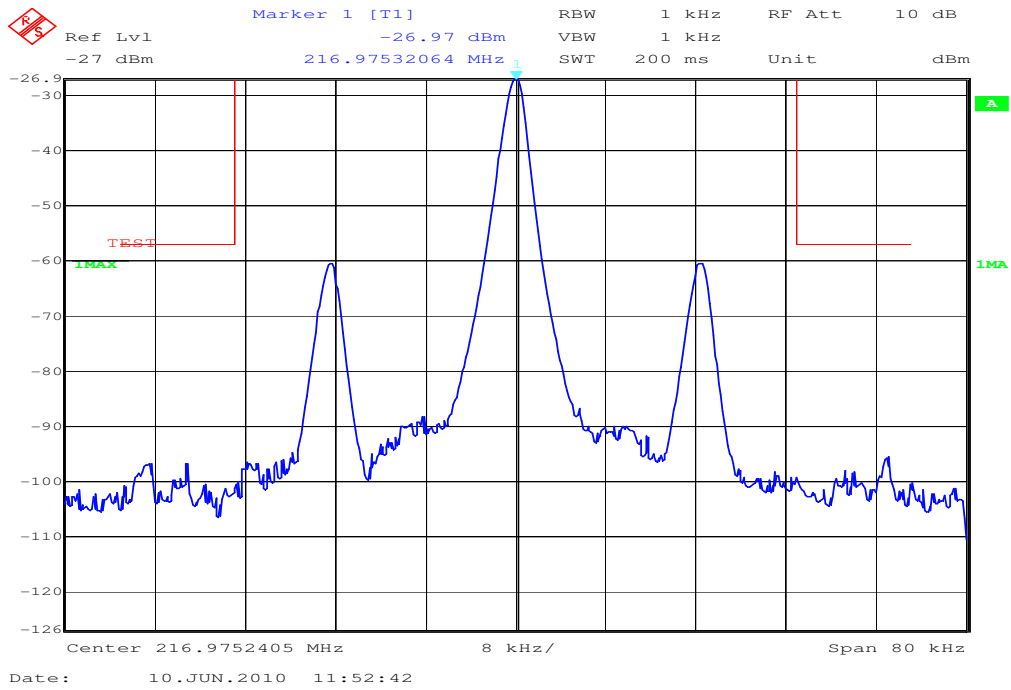
Plot 5: middle channel – 1kHz modulated carrier



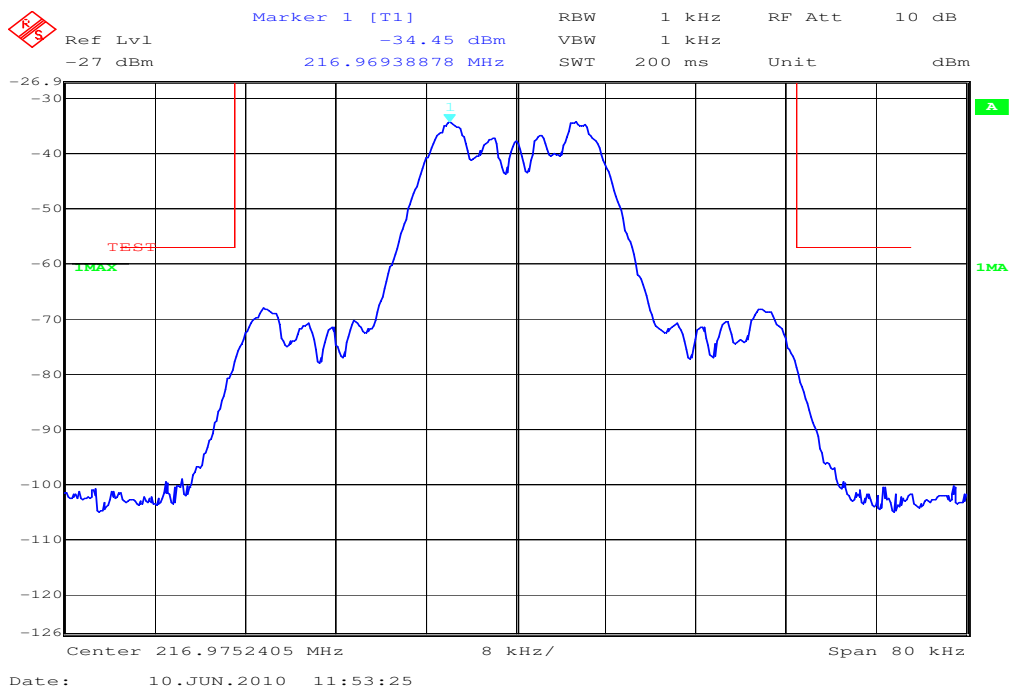
Plot 6: middle channel – Range 0.1 kHz → 10 kHz modulated carrier



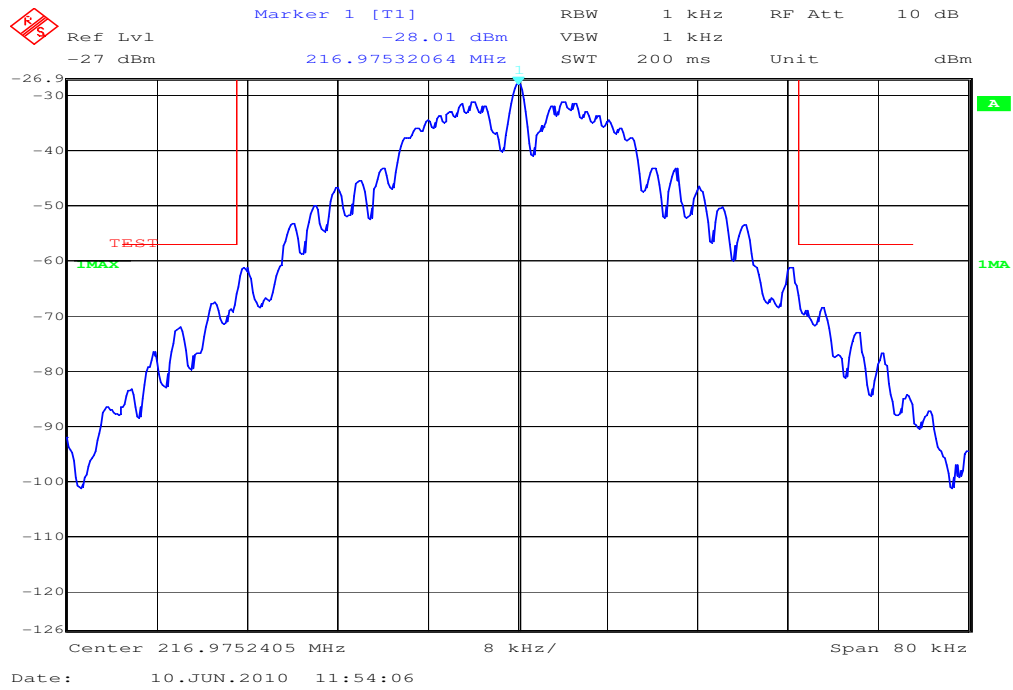
Plot 7: highest channel – unmodulated carrier



Plot 8: highest channel – 1kHz modulated carrier



Plot 9: highest channel – Range 0.1 kHz → 10 kHz modulated carrier

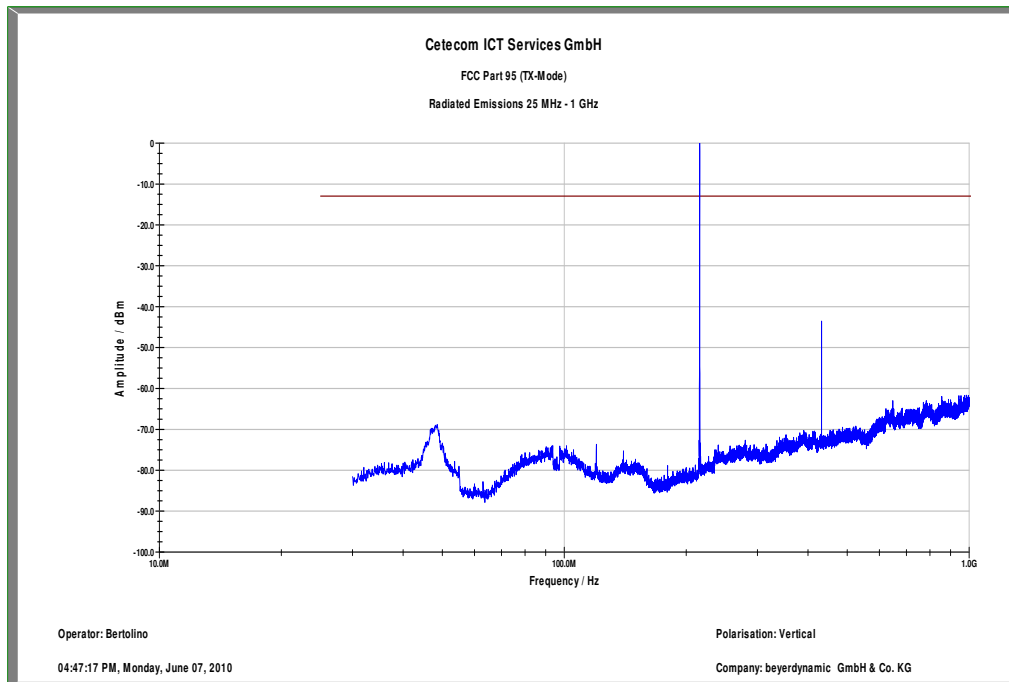


**5.9 Radiated spurious emissions**

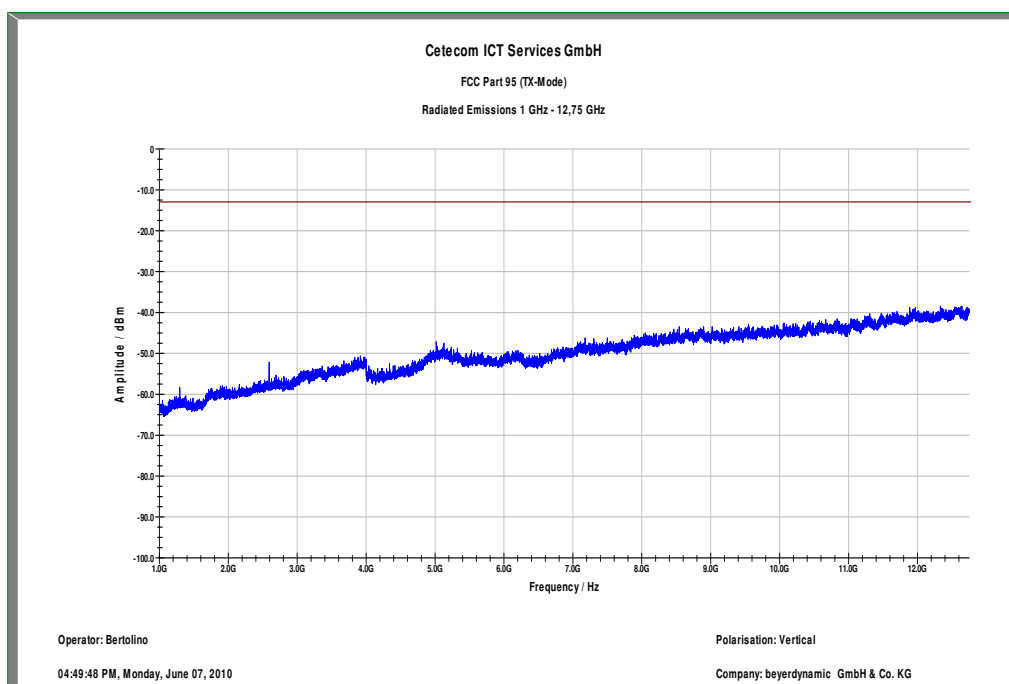
Standards:
FCC Part 2 – subpart J: Certification § 2.1053
FCC Part 2 § 2.1047
FCC Part 95 – subpart E: Technical regulations § 95.635 (c) (2) (ii)

**Handheld transmitter Synexis TH2:**

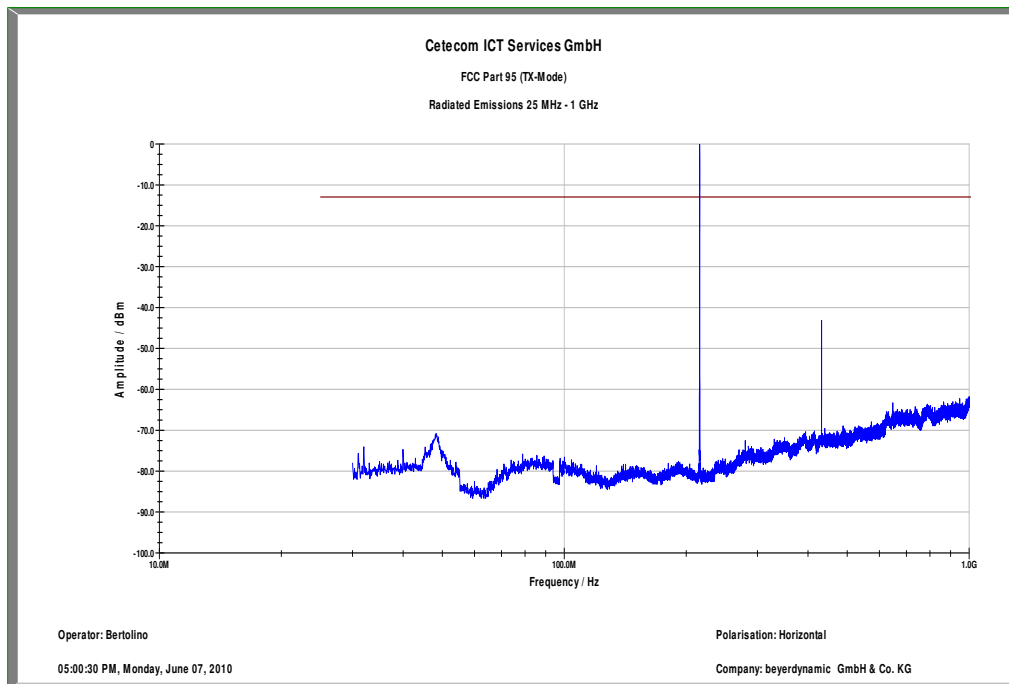
**Plot 1:** 0.03 – 1 GHz, vertical polarization, low channel



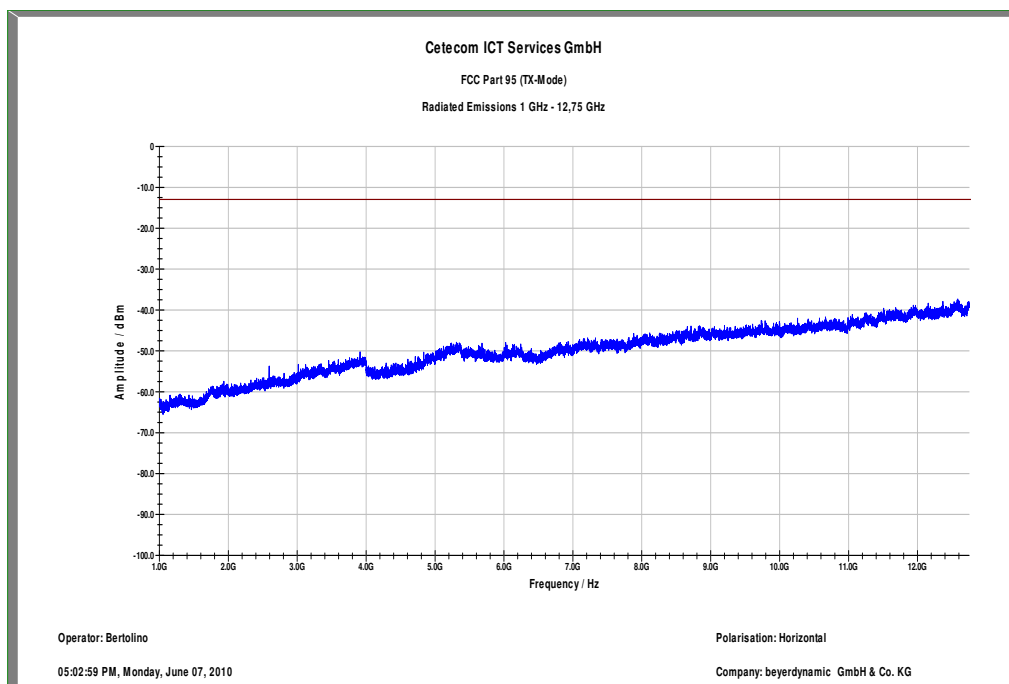
**Plot 2:** 1 – 12.75 GHz, vertical polarization, low channel



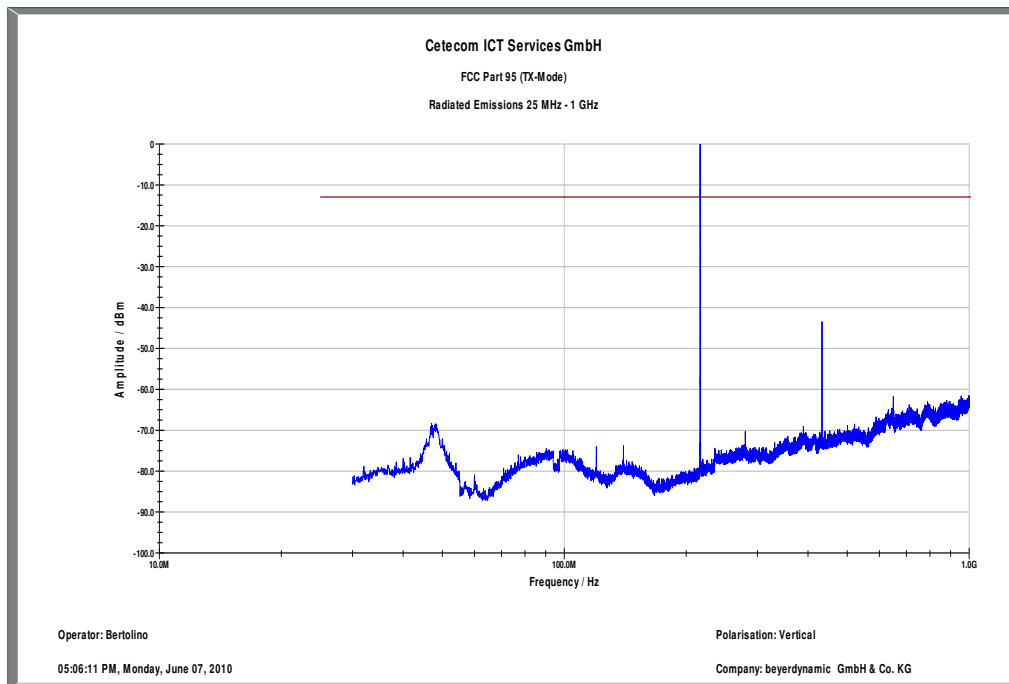
Plot 3: 0.03 – 1 GHz, horizontal polarization, low channel



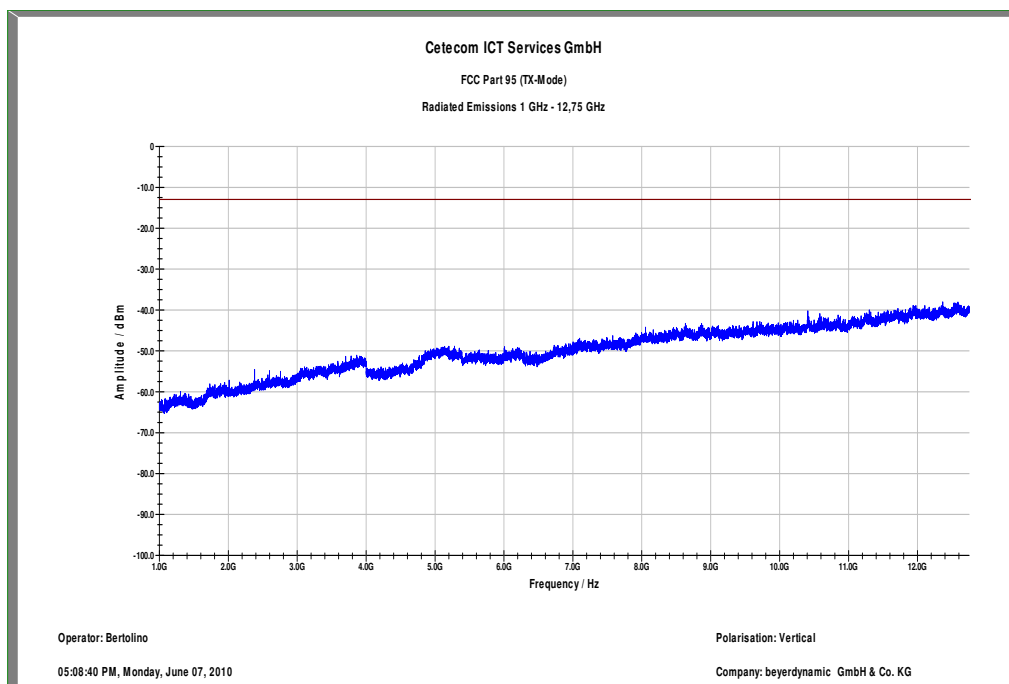
Plot 4: 1 – 12.75 GHz, horizontal polarization, low channel



Plot 5: 0.03 – 1 GHz, vertical polarization, middle channel

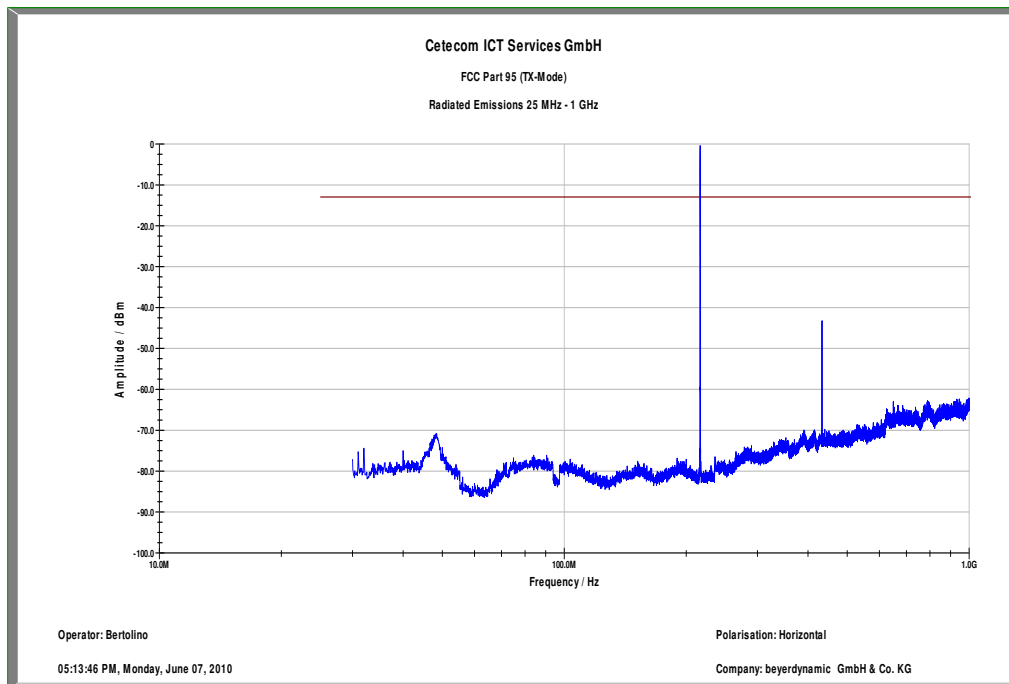


Plot 6: 1 – 12.75 GHz, vertical polarization, middle channel

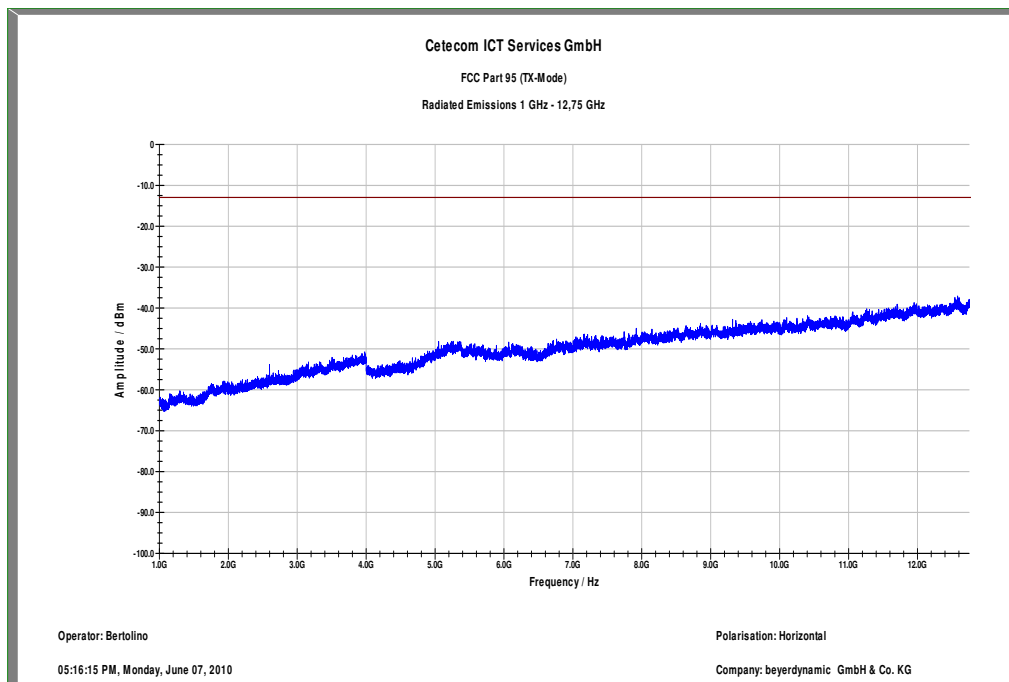




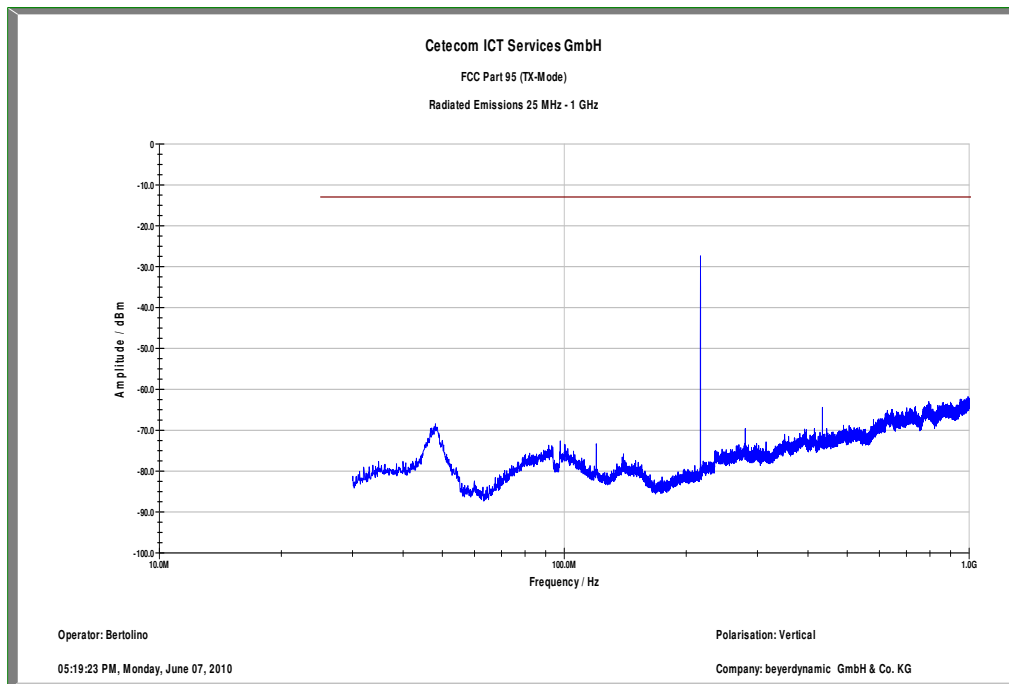
Plot 7: 0.03 – 1 GHz, horizontal polarization, middle channel



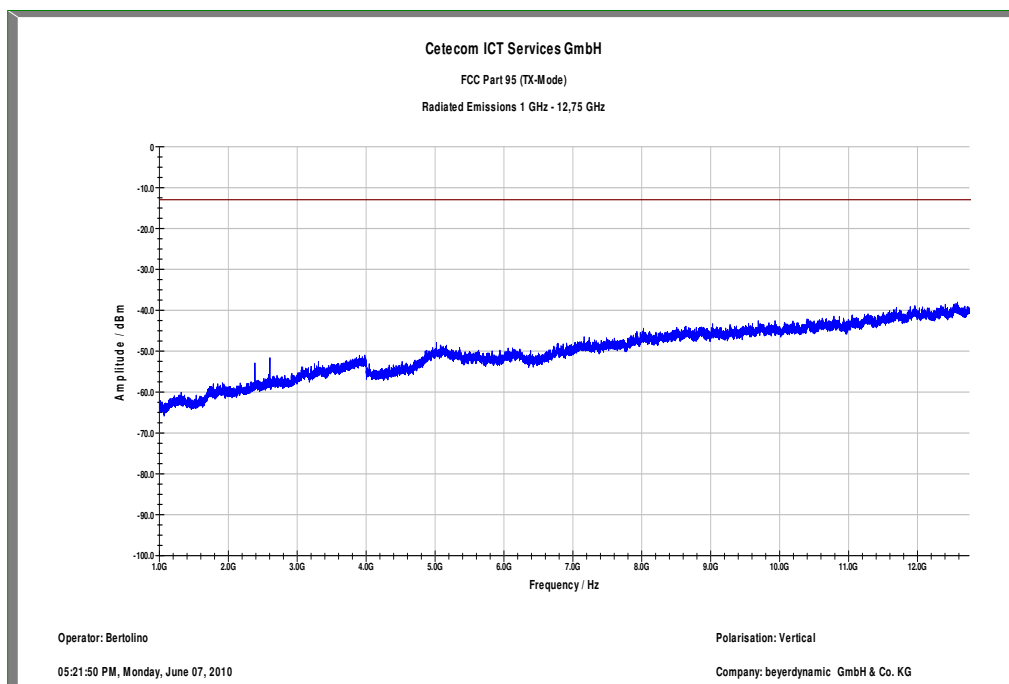
Plot 8: 1 – 12.75 GHz, horizontal polarization, middle channel



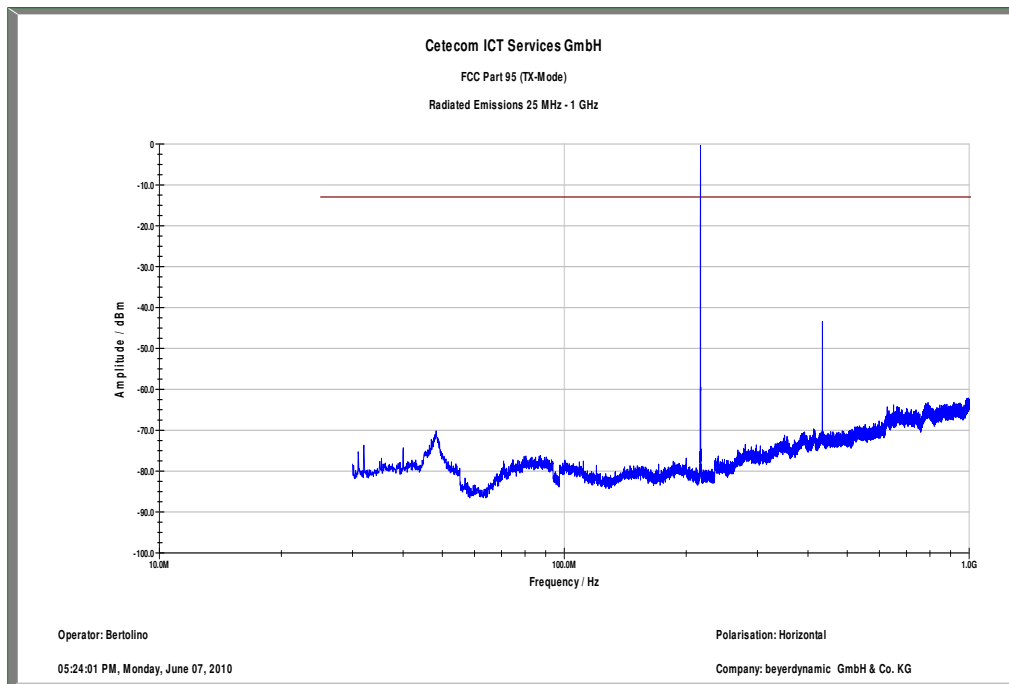
Plot 9: 0.03 – 1 GHz, vertical polarization, high channel



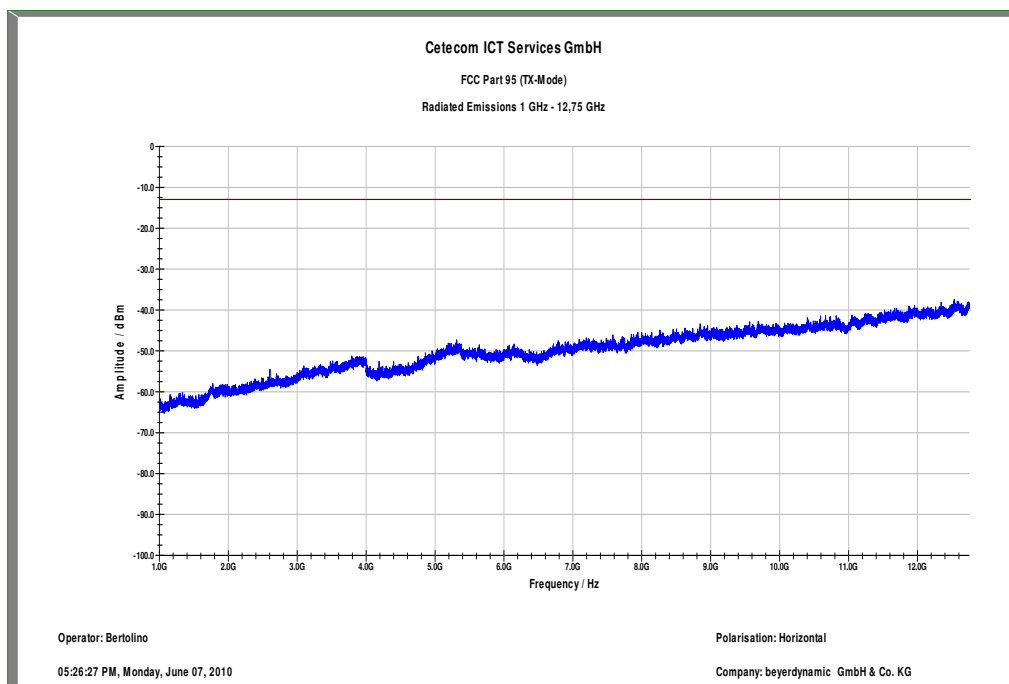
Plot 10: 1 – 12.75 GHz, vertical polarization, high channel



Plot 11: 0.03 – 1 GHz, horizontal polarization, high channel



Plot 12: 1 – 12.75 GHz, horizontal polarization, high channel



**Results: Synexis TH2**

**Results:**

SPURIOUS EMISSIONS LEVEL								
FCC Part 95 – subpart E: Technical regulations § 95.635 (c) (2) (ii)								
Low channel			Middle channel			High channel		
Frequency	Detector	Level	Frequency	Detector	Level	Frequency	Detector	Level
432.05 MHz	120 kHz PP	-42.96 dBm vertical -42.09 dBm horizontal	433.06 MHz	120 kHz PP	-43.09 dBm vertical -42.22 dBm horizontal	433.96 MHz	120 kHz PP	-43.17 dBm vertical -42.53 dBm horizontal
2592.00 MHz	1 MHz PP	--47.68 dBm vertical --45.81 dBm horizontal	-/-	-/-	-/-	-/-	-/-	-/-
All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.		
Measurement uncertainty ± 3 dB								

f < 1 GHz : RBW/VBW: 120 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

**Limits:**

FCC Part 95 – subpart E: Technical regulations § 95.635 (c) (2) (ii) -13 dBm
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## 6 Test equipment and ancillaries used for tests

In order to simplify the identification of the equipment used at each specific test, each item of test equipment and ancillaries are provided with an identifier or number in the equipment list below.

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

No.	Labor / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kal. Art	Last Calibration	Next Calibration
1	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	05.03.2009	05.03.2011
2	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
3	n. a.	Anechoic chamber		MWB	87400/02	300000996			
4	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
5	9	Artificial Mains 9 kHz to 30 MHz, 4 x 25 Ampere	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
6	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
7	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
8	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
9	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
10	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
11	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
12	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
13	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-	EMCO	none	300003451	ne		

			ICS/FULL						
14	n. a.	Highpass Filter	WHKX2.9/18 G-12SS	Wainwright	1	300003 492	ev		
15	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003 255	ev		
16	n. a.	Highpass Filter	WHKX7.0/18 G-8SS	Wainwright	18	300003 789	ne		
17	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY482 50080	300003 812	k	05.08. 2008	05.08. 2010
18	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY474 20220	300003 813	k	06.08. 2008	06.08. 2010
19	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY482 60003	300003 825	vIKI!	19.08. 2008	19.08. 2010
20	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003 854	vIKI!	17.12. 2008	17.12. 2010
21	n. a.	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003 443	ve		
22	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/841 93	300003 889	vIKI!	28.05. 2009	28.05. 2011
23	4	Radiocom. Analyzer	CMTA 54	R&S	894043/ 010	300001 175	NK!		
24	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/837 61	300002 326	Ve	28.05. 2009	28.05. 2011
25	n. a.	Audio Analyzer 2Hz - 300 kHz	UPD	R&S	841074/ 009	300001 236	k	08.01. 2010	08.01. 2012
26	n. a.	Signal Analyzer 20Hz- 26,5GHz- 150 to + 30 DBM	FSiQ26	R&S	835111/ 0004	300002 678	Ve	06.01. 2009	06.01. 2011
27	45	Switch-Unit	3488A	HP Meßtechnik	2719A1 4505	300000 368	g		
28	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A0 4466	300000 580	k	06.01. 2009	06.01. 2011
29	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081; B5979	300000 210	ne		
30	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003 312	k	08.01. 2010	08.01. 2012

31	n. a.	Analyzerr-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003 314	k		
32	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003 379	ev		
33	n. a.	Antenna Tower	Model 2175	ETS-LINDGRE N	64762	300003 745	izw		
34	n. a.	Positioning Controller	Model 2090	ETS-LINDGRE N	64672	300003 746	izw		
35	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGRE N	44583	300003 747	izw		
36	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003 787	k		
37	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003 874	k	08.01. 2010	08.01. 2012

## 7 Photographs of the Test Set-up

Photo documentation:

Photo 1:

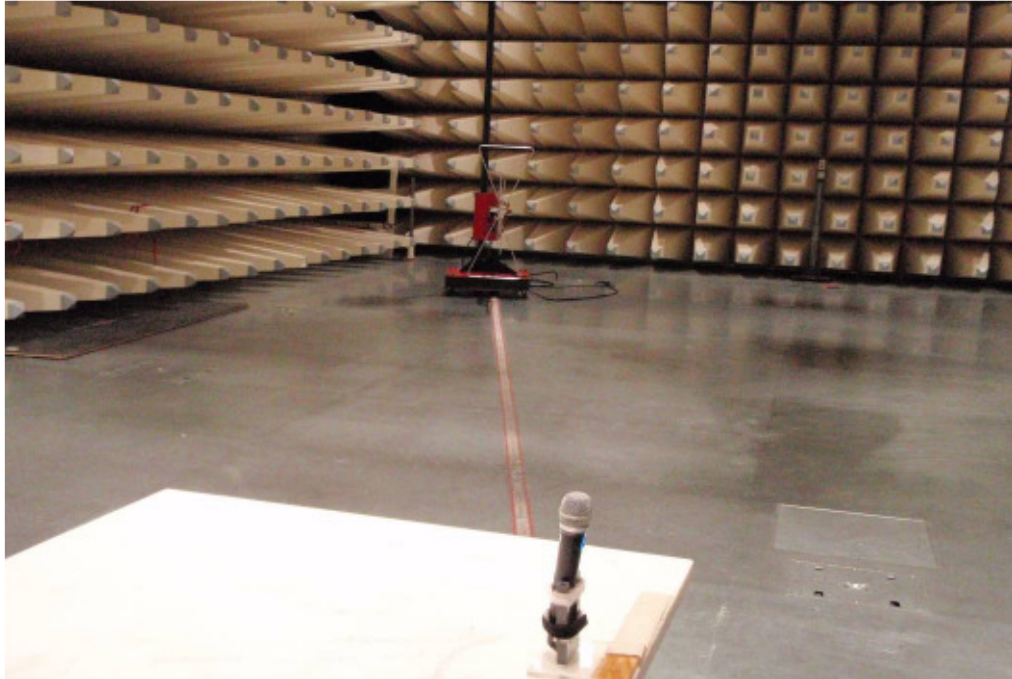
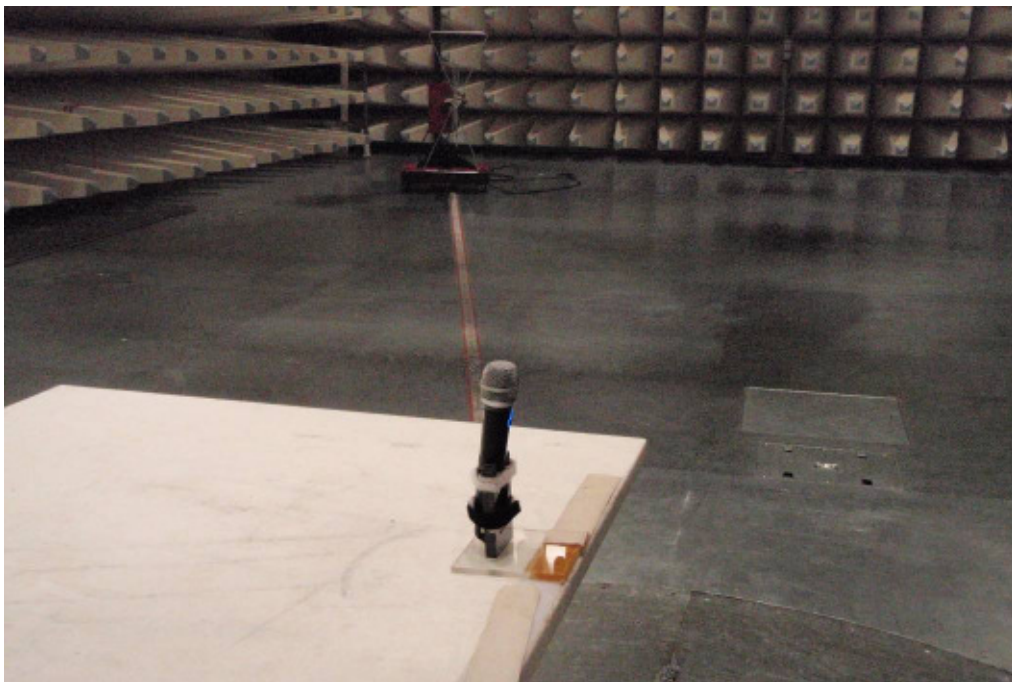


Photo 2:





## 8 Photographs of the EUT

Photo documentation: external photos

Photo 1:



Photo 2:



Photo 3:



Photo 4:



Photo 5:

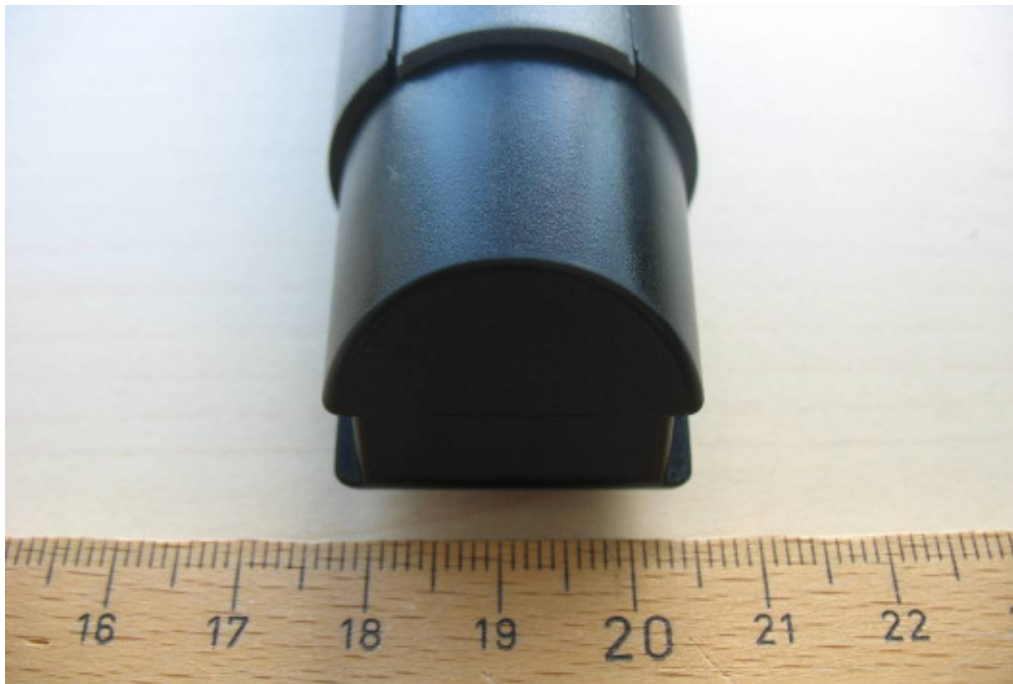


Photo 6:



Photo 7:



Photo 8:





Photo documentation: internal photos

Photo 1:



Photo 2:



Photo 3:



Photo 4:



Photo 5:



Photo 6:



Photo 7:



Photo 8:

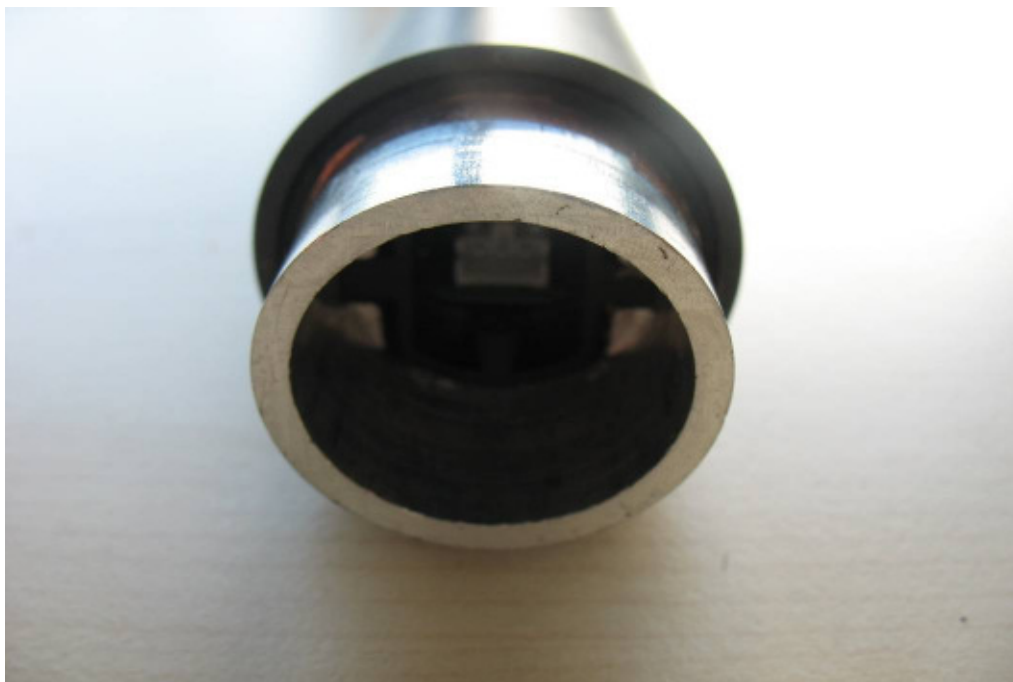




Photo 9:

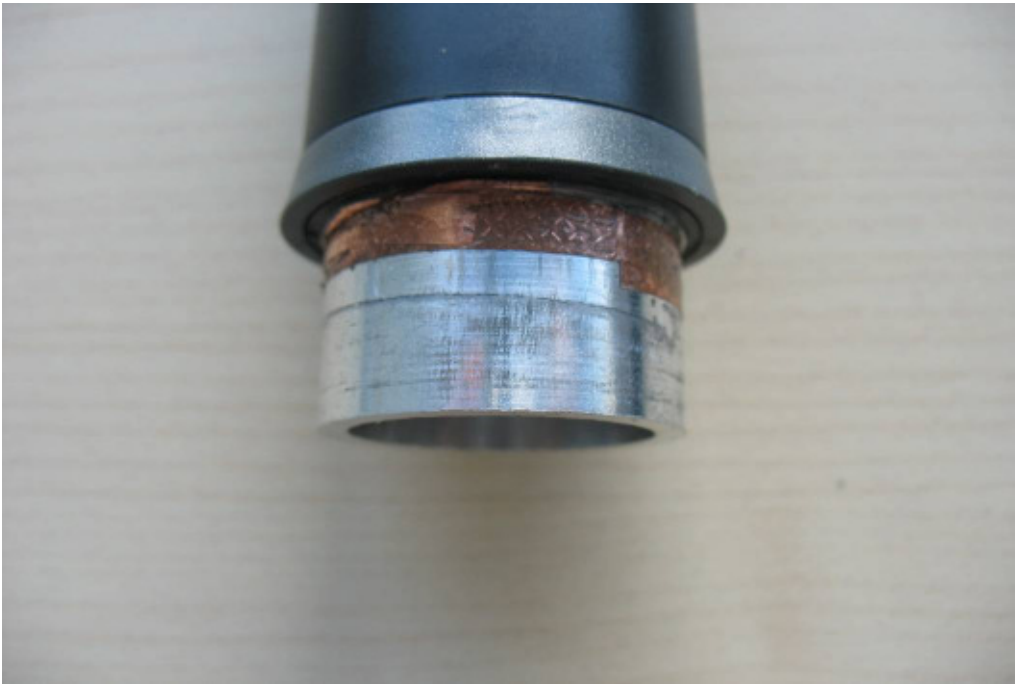


Photo 10:

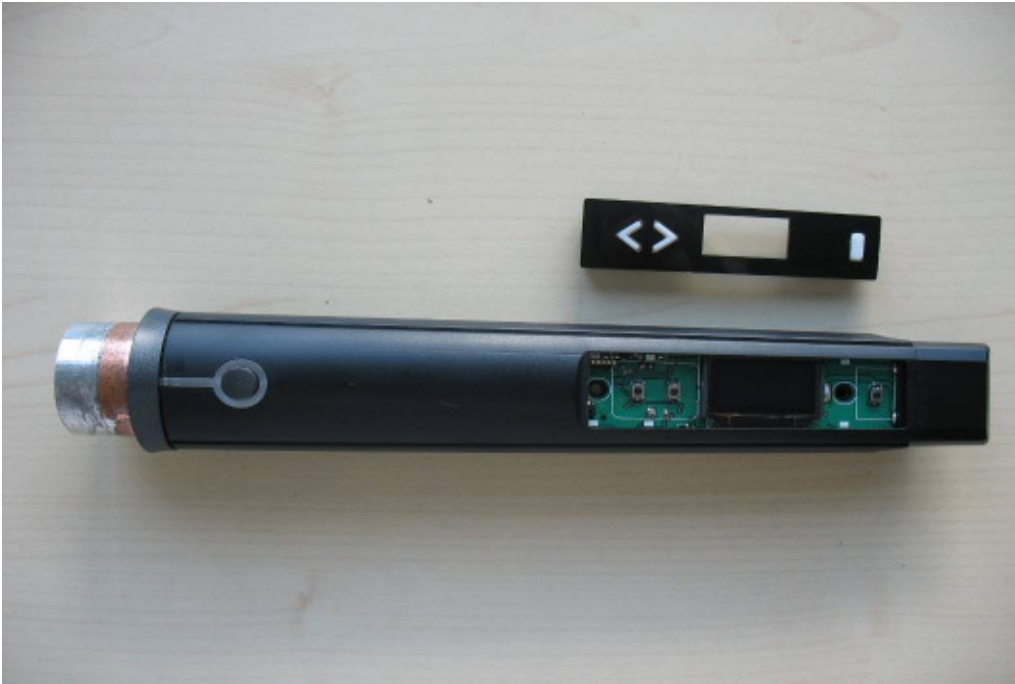


Photo 11:



Photo 12:

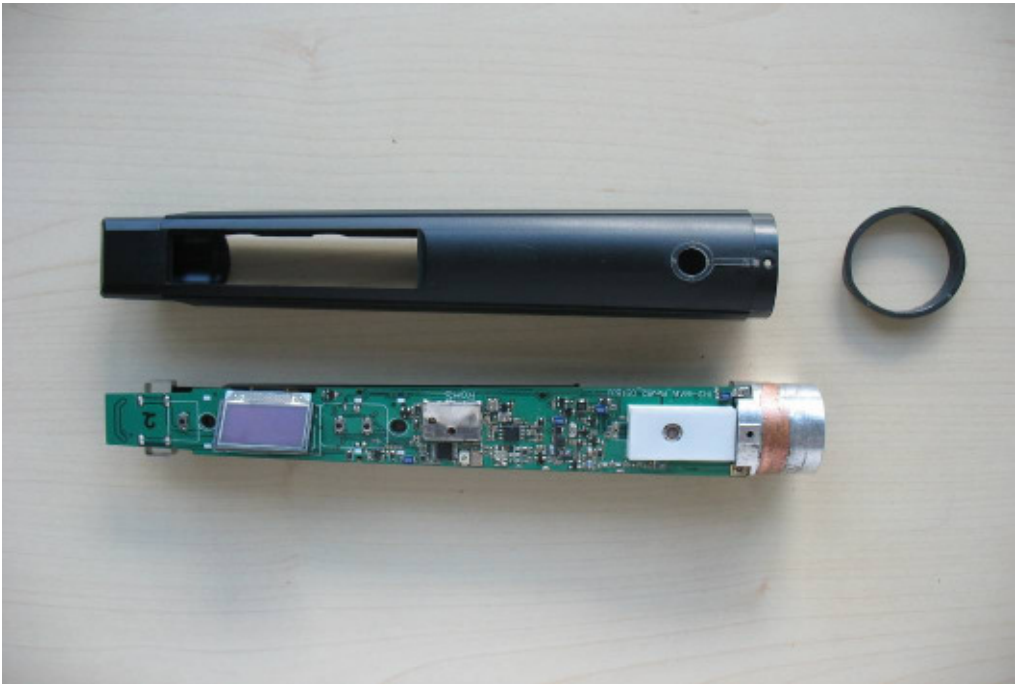


Photo 13:

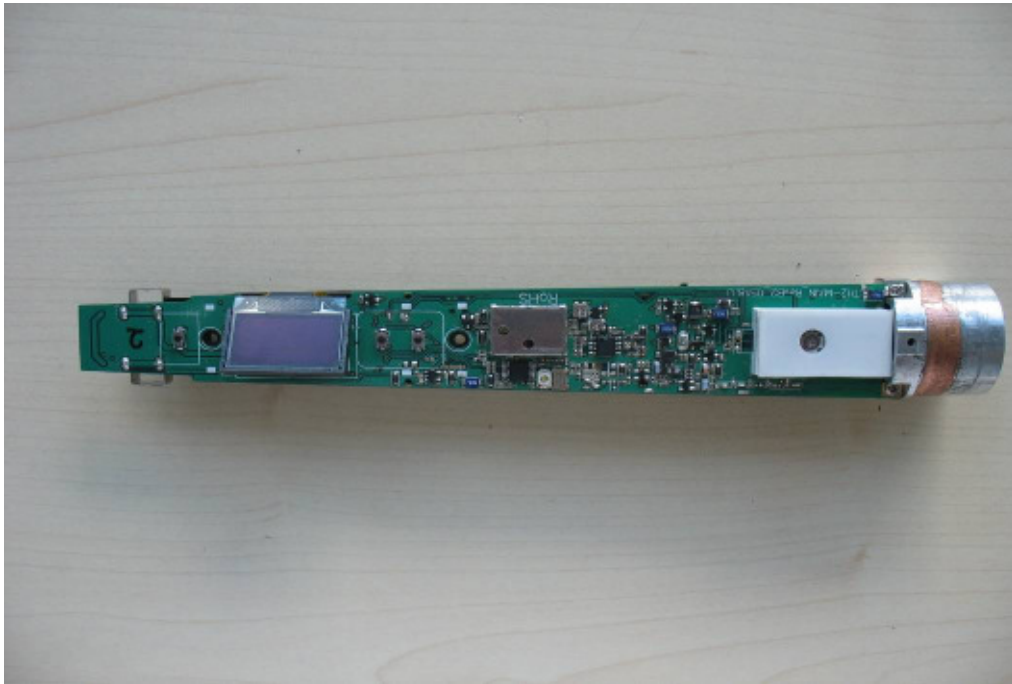


Photo 14:

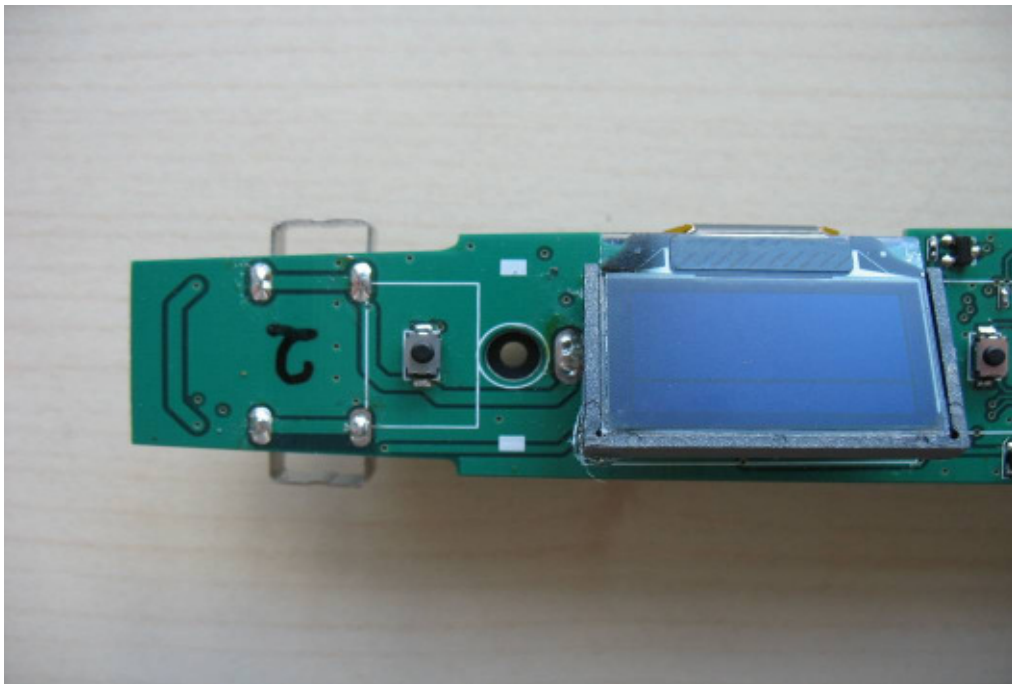


Photo 15:

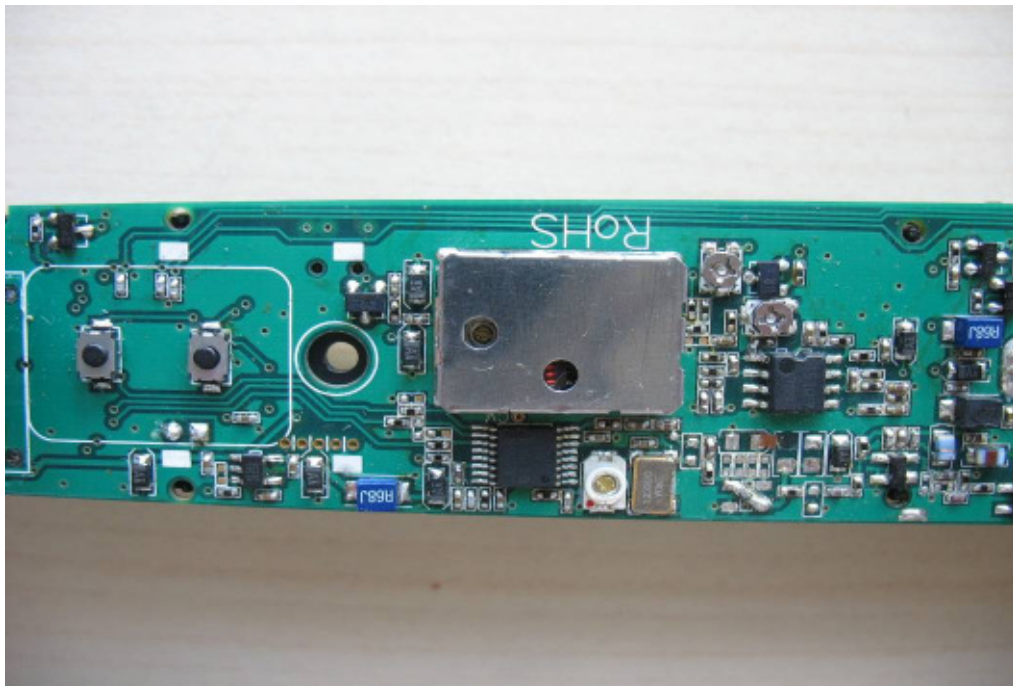


Photo 16:

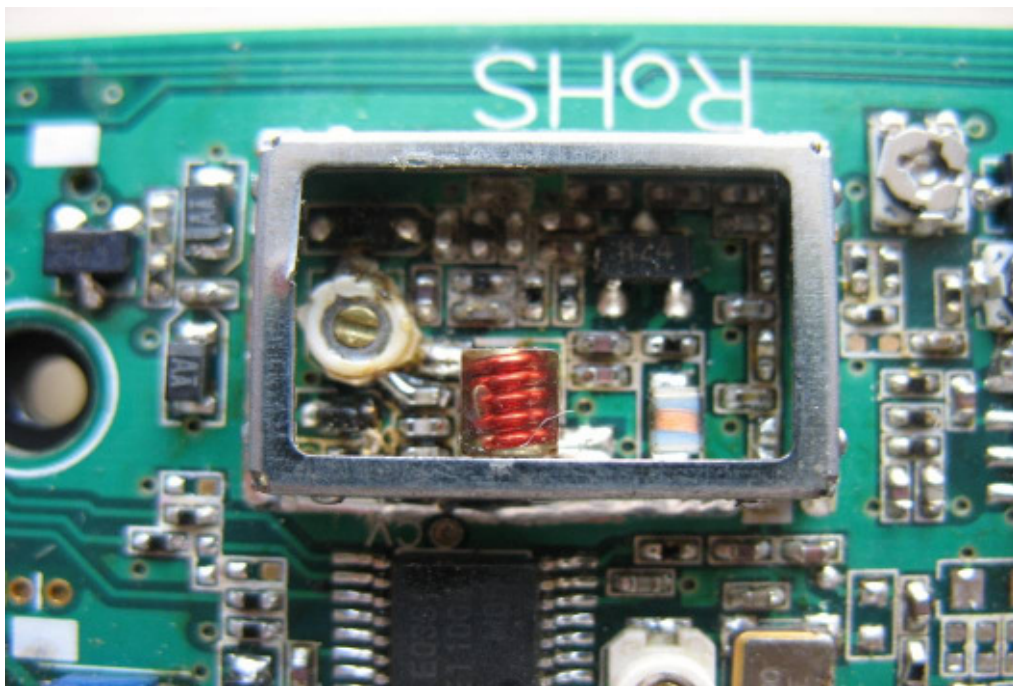




Photo 17:

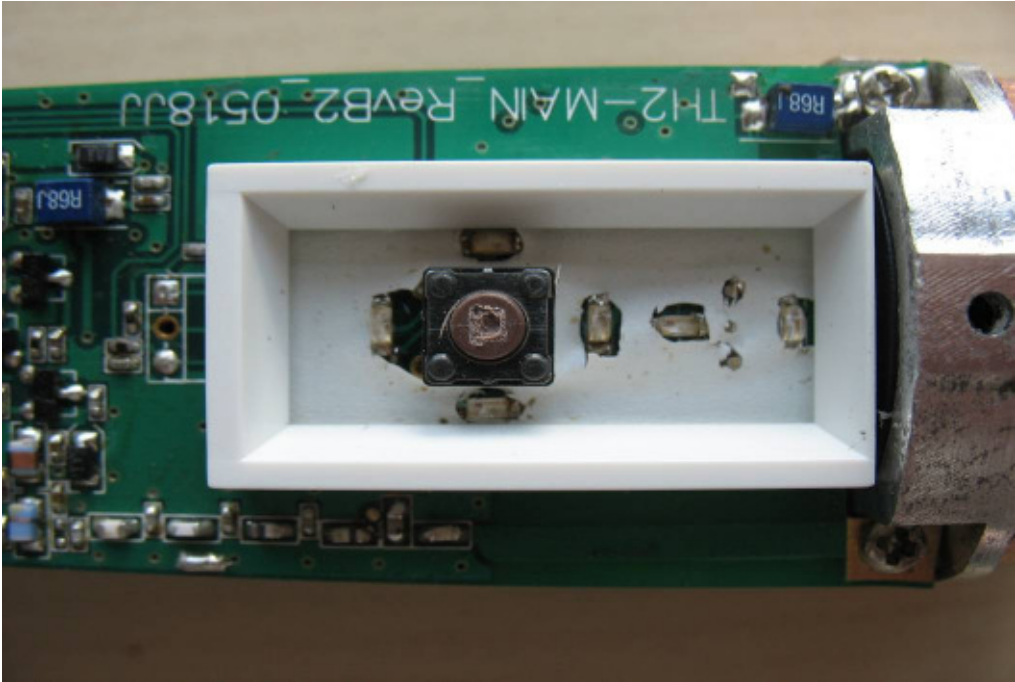


Photo 18:

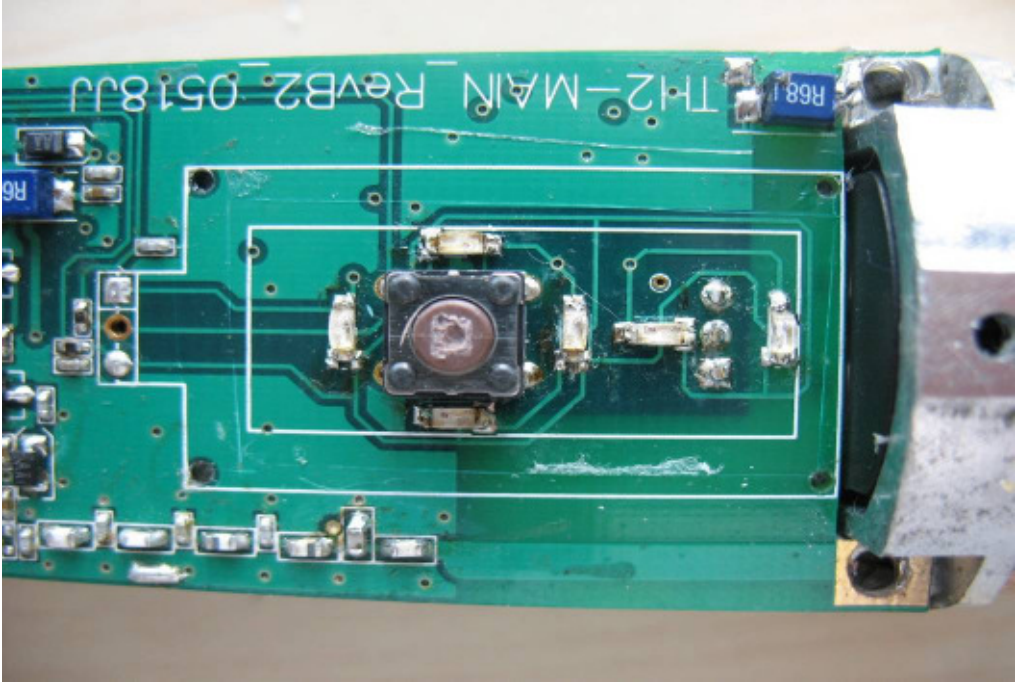


Photo 19:

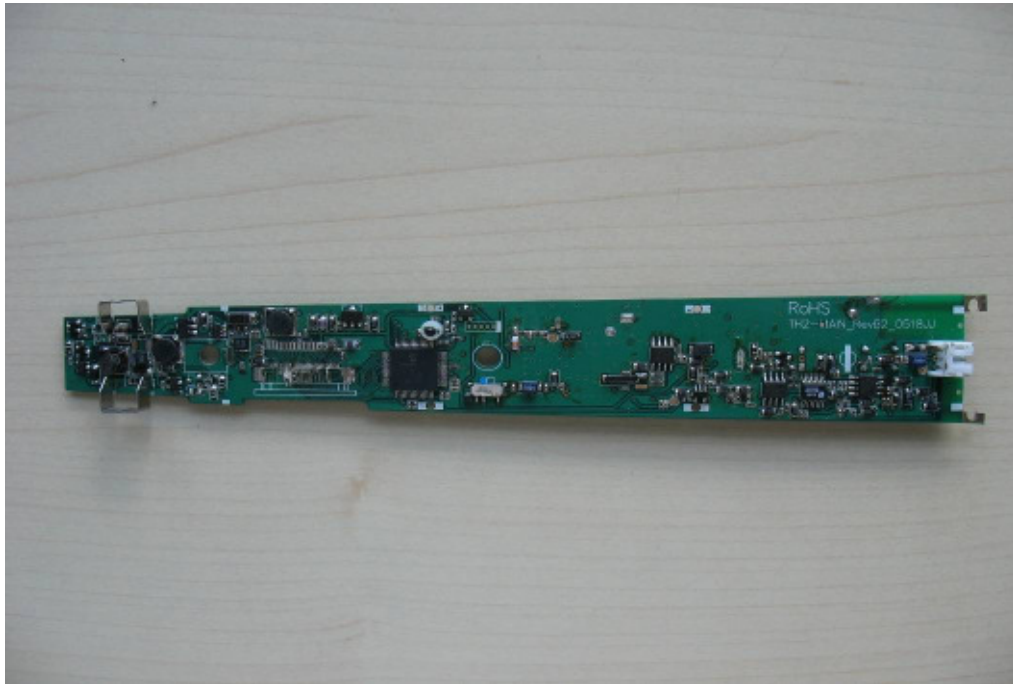


Photo 20:

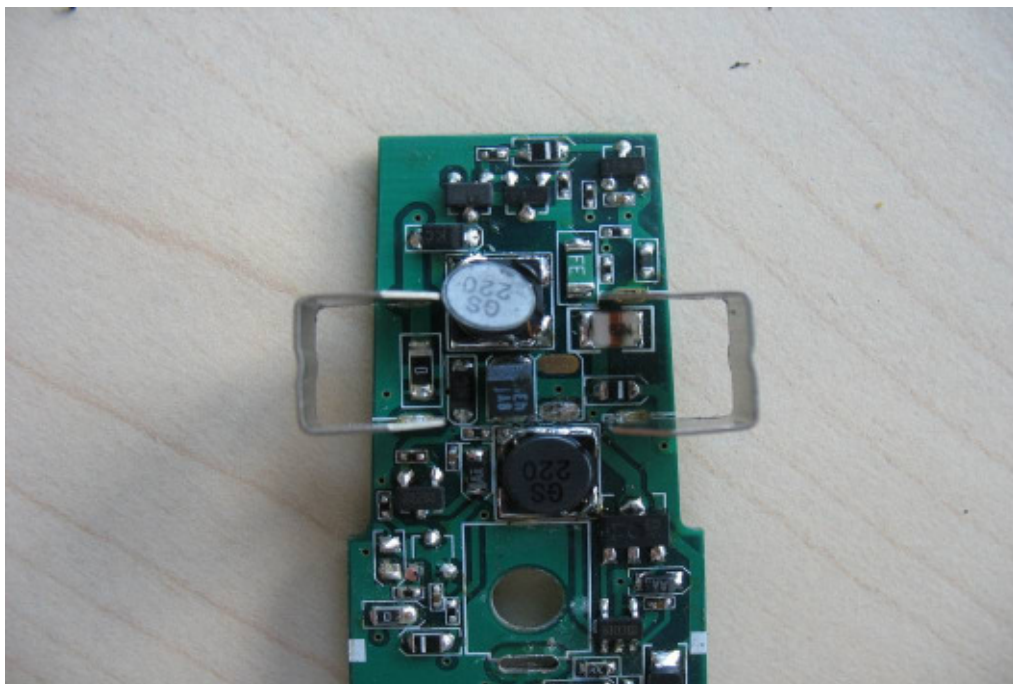


Photo 21:

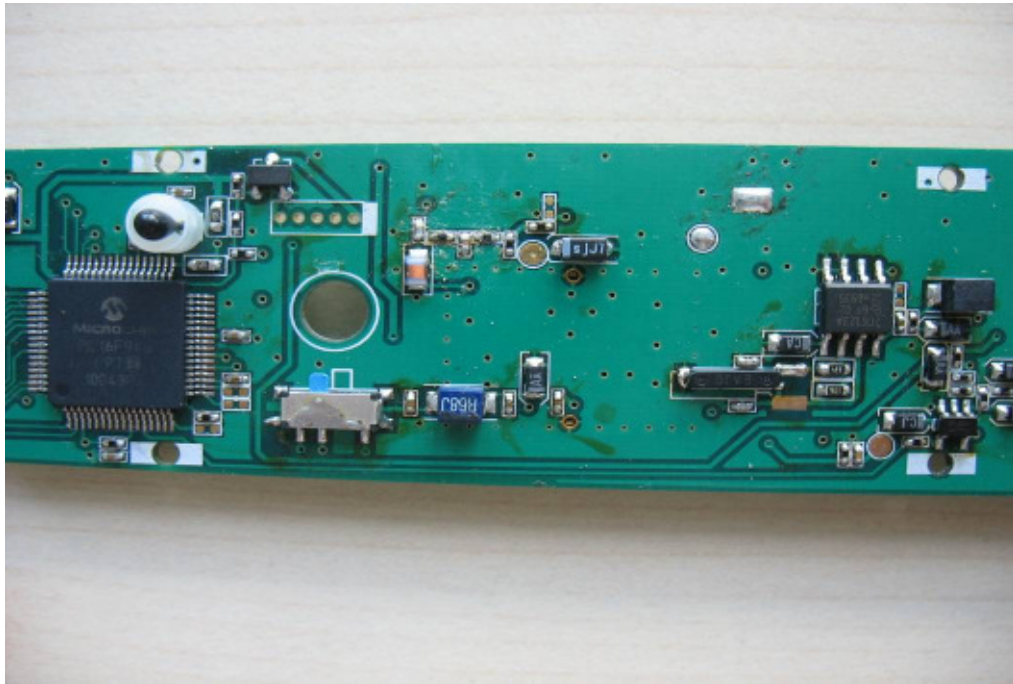


Photo 22:

